



PATENT APPLICATION

IN THE U.S. PATENT AND TRADEMARK OFFICE

Applicants: Takashi DATE et al

For: THERMALLY-SENSITIVE RECORDING MATERIAL

Serial No.: 10/551 675 Group: 1794

Confirmation No.: 5519

Filed: September 29, 2005 Examiner: Hess

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Atty. Docket No.: 4364.P0013US

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION UNDER 37 CFR 1.132**

I, the undersigned, hereby declare as follows:

I am one of the inventors of the invention described and claimed in application Serial No. 10/551 675, filed on September 29, 2005.

I hereby incorporate by reference herein the contents of the Examples and Comparative Examples contained on pages 19-33 of application Serial No. 10/551 675.

I have prepared additional tests to illustrate the importance of the claimed acrylic polymer and chain colloidal silica in forming the thermally sensitive recording medium of the present invention.

Additional comparative thermally sensitive recording mediums were prepared in which the acrylic emulsion/colloidal silica composite resin of Hata et al was used except that the composite resin had a higher spherical colloidal silica content than in Comparative Example 3 of application Serial No. 10/551 675. The compositions are shown below in Table 1.

TABLE 1

Composition of Example 1, Comparative Example 3, Revised Comparative Example 3' and Revised Comparative Example 3"

Example 1

	acrylic polymer	chain colloidal silica	Total
conc. (%)	40	21.5	
wet parts	20	20	
dry parts	8	4.3	12.3

Comparative Example 3

	Movinyl 8020	spherical colloidal silica	Total
conc. (%)	40	10	
wet parts	20	-	
dry parts	7.8	0.2	8

Revised Comparative Example 3' (total dry parts is fixed)

	Movinyl 8020	spherical colloidal silica	Total
conc. (%)	40	10	
wet parts	30	-	
dry parts	10.8	1.2	12

Revised Comparative Example 3"

(amount of total colloidal silica is fixed)

	Movinyl 8020	spherical colloidal silica	Total
conc. (%)	40	10	
wet parts	100	-	
dry parts	36	4	40

The above compositions were evaluated for color-developing sensitivity, water resistance, printing aptitude and dregs on a head. The results are shown below in Table 2.

TABLE 2

## Evaluation results

	Color developing sensitivity (1)/(2)	Water resistance	Printing aptitude	Dregs on a head
Example 1	0.91/1.23	○	○	○
Comparative Example 3	0.85/1.29	x	x	x
Revised Comparative Example 3'	0.83/1.16	△	x	x
Revised Comparative Example 3"	0.60/0.85	○	△	x

## DISCUSSION OF RESULTS

Although Comparative Examples 3' and 3" had higher silica contents than Comparative Example 3, they still exhibited inferior results to Example 1 of the present invention due to the spherical colloidal silica being provided covering the polymer particles as opposed to the colloidal silica and acrylic polymer being provided as required in the present invention. As a result, the properties of the inventive composition is clearly superior to that of the comparative examples.

I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: 2008/11/27

Nagai Tatsuo  
(Signature)

—プロローグ—



## コロイダルシリカ複合合成樹脂エマルジョン

### 基礎技術

COLLOIDAL SILICA COMPOSITE SYNTHETIC RESIN EMULSION

Technical information

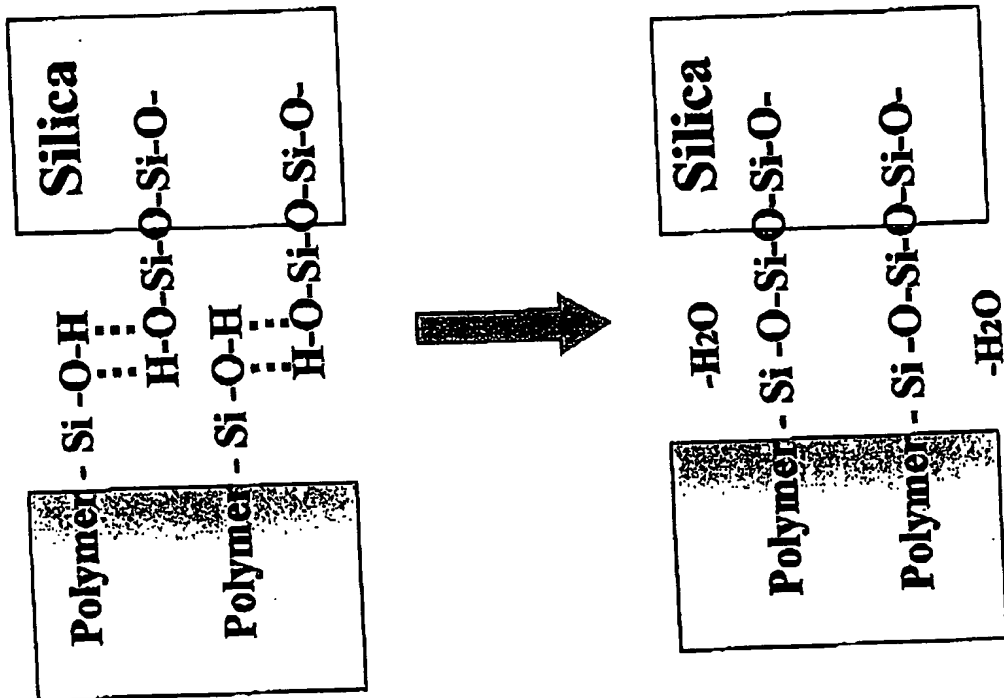
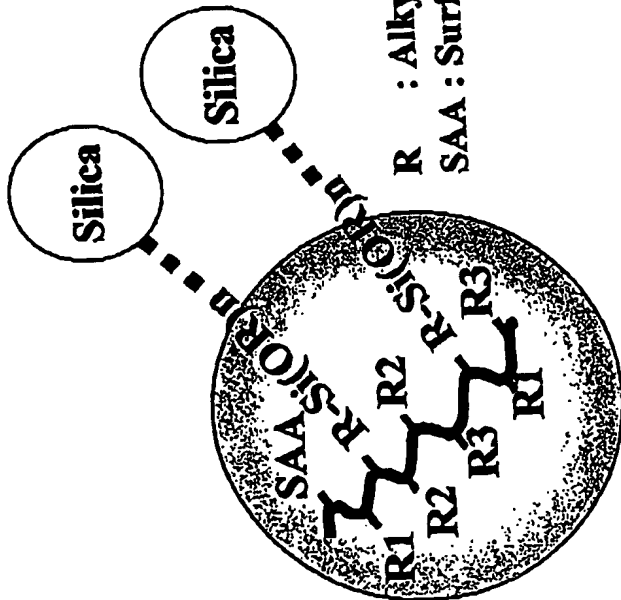
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Clariant Polymers K.K.

Nov. 2002

# 無機物＋有機物の化学的複合化により...

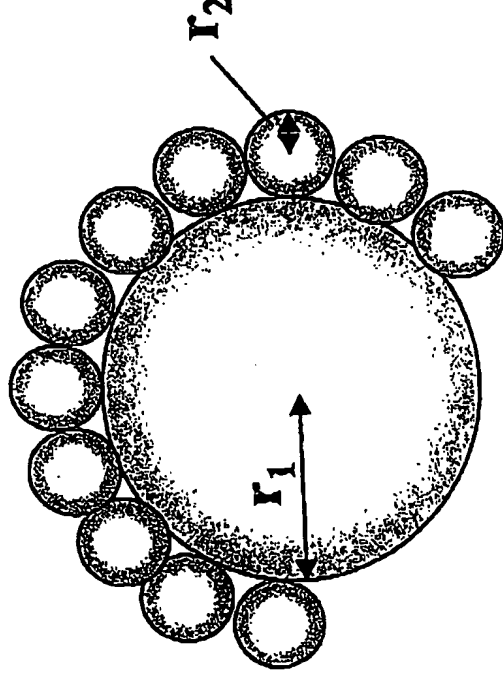
By chemical composite of Inorganic compound+organic compound



無機粒子と有機粒子の立体的な相互関係  
を利用して... inorganic particles and organic particles

$$N_M = 2\pi (r_1 + r_2)^2 / \sqrt{3} r_2^2$$

- $N_M$  : Maximum number of the small particle can cover completely the big particle  
 $r_1$  : a radius of the big particle ( polymer particle )  
 $r_2$  : a radius of the small particles ( silica particles )



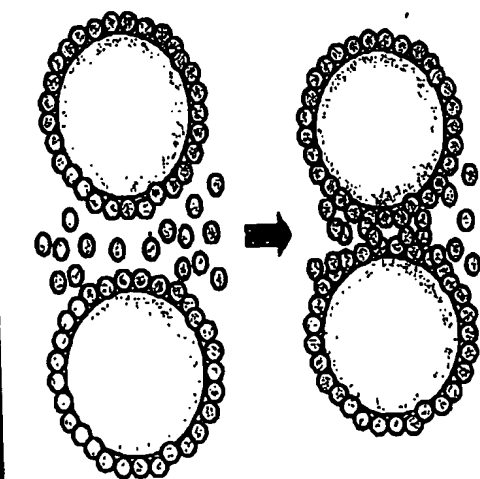
# 無機物＋有機物の複合化による樹脂粒子の融着阻害を利用すると....



LBU Emulsions R&D Team

when fuse adhesion inhibition of resin particles by composite of

inorganic compound + organic compound is used

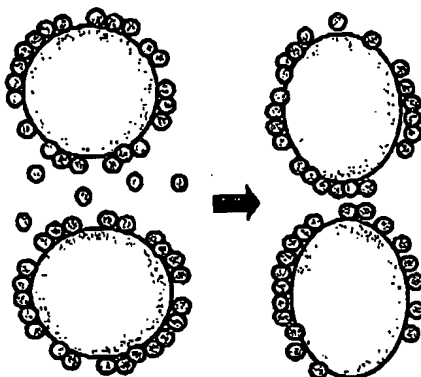


uniform film forming is disturbed by surplus silica particles

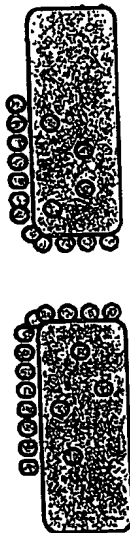


$$a / N_M > 5$$

It can not form a uniform film

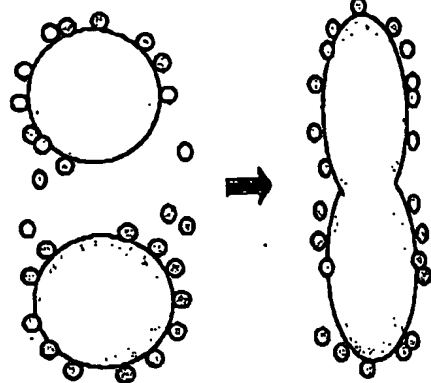


Film forming is partially disturbed by silica particles



$$a / N_M = 0.2-4$$

It can form a porous film



Film forming is not disturbed



$$a / N_M < 0.2$$

It can form a uniform film

$a$  : the number of silica particles per one polymer particle

$N_M$  : the maximum number of the small particles which can cover completely a polymer particle



Clariant

LBU Emulsions R&D Team

# 特殊な細孔を有すフィルムが得られます！-1

film having specific fine pores can be obtained

Emulsion: 50wt%

silica : 50wt%

small

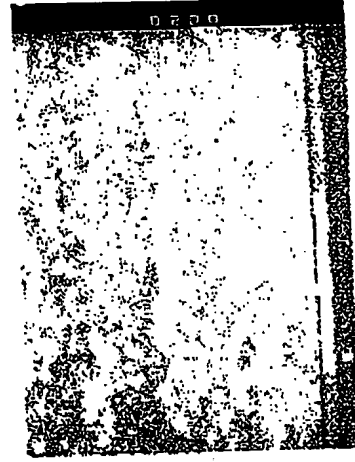
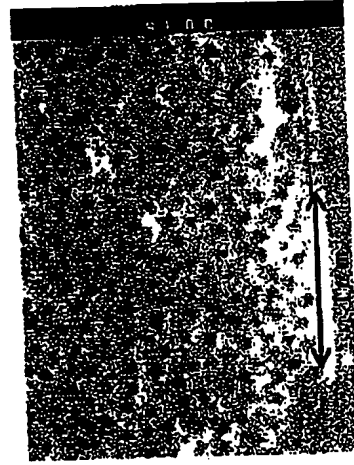
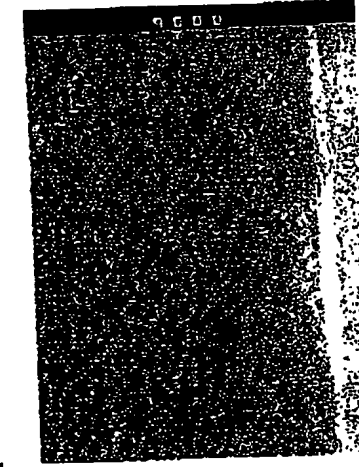
Silica particle size

large

small

Emulsion particle size

large



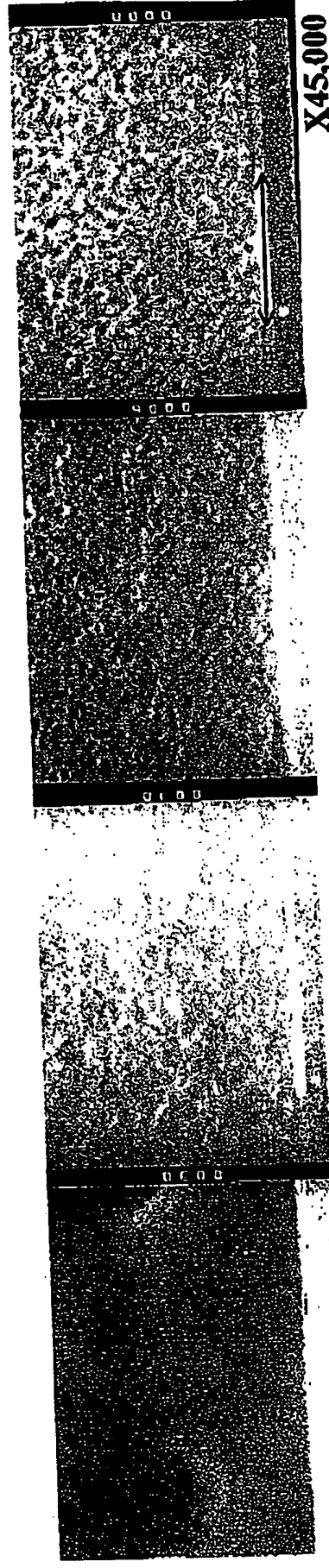
X45,000

Coating on glass plate  
Drying at r. t.



# 特殊な細孔を有すフィルムが得られます！-2

film having specific fine pores can be obtained



0%

30%

50%

70%

Colloidal silica contents (wt %/ final sample solid content.)

Coating on glass plate  
Drying at r. t.

Nov. 2002

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